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Special Issue for Early Career Researchers: editorial

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This Special Issue of the *Scottish Journal of Geology* examines the scientific contribution of Early Career Researchers exploring Scotland's rich geology, geomorphology, geochemistry, hydrogeology, geothermal energy and decarbonisation both onshore and offshore (Fig. 1). The collected works will serve to highlight the often-overlooked contribution of research undertaken by Early Career Researchers from a range of career stages encompassing studies undertaken during undergraduate and Masters degrees, to those undertaken by doctoral candidates, and post-doctoral researchers.

It is generally acknowledged that 'young' scientists face a harsher, increasingly competitive, and oftentimes more challenging working environment than previously experienced (e.g. as reported in a *Nature* Editorial (Anonymous 2016)). Although it is not within the scope of this [online thematic collection](#) to address all the factors impacting Early Career Researchers today, it is the aspiration of this collection that the contribution of Early Career Researchers to cutting-edge research is appropriately recognised, credited and the perceived barriers to publishing are removed.

The vast reservoir of data, insight and understanding contained within unpublished academic theses has never been adequately represented in the published literature. There are many barriers for young researchers to overcome to get their thesis work into journals. There are the practical barriers of the temporary existence of being a postgraduate before post-doctoral opportunities, and gainful employment, diverts attention to other projects. Additionally, the mismatch between the timeframe of doing a one-year Masters by research and the lead time for writing, revising and publishing a journal paper results in key research conclusions

remaining locked in unpublished works. There are less tangible barriers, not least the confidence to commit one's earliest research to publication, developing the necessary presentational skills, having the resilience to cope with harsh reviews, and variable levels of supervisory encouragement. Conversely, many postgraduate researchers benefit from the pressure to publish that their supervisors face: probably more papers come from Early Career Researchers than has previously been the case because established scientists wish (or are required) to convert their supervisory efforts into measurable outputs.

Paradoxically, academic publishers have been slow to adapt to the contribution from authors at early career stages. A quick online search reveals only a handful special journal issues devoted exclusively to early career research in the last few years, across all areas of publishing. Scientific publishing has transformed dramatically in the last twenty years. The number of journals and frequency of publication within Earth science has multiplied to accommodate the greater number more global spread of high-level scientific research. In many countries, there has been growing pressure on individuals to publish frequently and in the 'best' journals. All this has developed in tandem with centralization of journal publishing away from learned societies' 'house' journals into a few large commercial publishers, a trend which has been extensively critiqued elsewhere. Early Career Researchers are particularly under pressure from these changes: completion of a high-quality thesis is no longer seen as the benchmark for measuring an individual's potential. There has to output: and this is now measured largely by secondary metrics rather than by the inherent quality of the research. It is becoming the norm for a doctoral thesis to be submitted as a portfolio of peer-reviewed papers. It is even the case that applicants for some funded doctoral studentships must have already published research to be eligible for the studentship. Early Career Researchers are at the front line of these changes.

The accepted works are distributed between more than one issue of the *Scottish Journal of Geology*, collected together as a virtual volume that aims to provide a platform to showcase early career research across Scottish geology. It is heartening, in a period of increasing focus on diversity within STEMM subjects, that an equal number of contributions were received from both sexes. The collection includes research from a Masters thesis with the author recently starting her doctoral research. Six of the contributions reflect doctoral research, with

contributions submitted mid-way through their studies as well as those recently completed. One contribution is from a team of researchers who met during their doctoral studies and continued their collaborations during their first post-doctoral placement, evidence that networks constructed during the early stages of your profession can shape your research interests for many years.

A better understanding of both ancient and modern fluvial systems are themes explored by McMahon & Davies (2019) who report on the fundamental underlying mechanisms of river behaviour and fluvial processes during the Proterozoic, and by a forthcoming article by Fieman *et al.* who use state-of-the-art models as part of a study into the 2015 'Storm Frank' flood on the River Dee, one of the largest flood events in the last 100 years. A study of the foliated amphibolites and associated pseudotachylytes of the Gairloch Shear Zone by Campbell *et al.* (2019) describes evidence for ancient seismicity in the pseudotachylyte-bearing fault rocks and discusses the controls on earthquake rupture behaviour that these fault rocks represent.

An improved understanding of the past cycles of glaciation, timing and extent, has far reaching implications for better understanding global climate change and ice-sheet behaviour. Two contributions to this collection explore Quaternary evolution of Scotland since the Last Glacial Maximum. The increasing availability of high-resolution marine geophysical data and cores has enabled Tarlati and co-workers, in an upcoming article, to more accurately reconstruct the extent and dynamics of the formerly glaciated margin of the Malin Sea during the final deglaciation of the British–Irish Ice Sheet. Abrook *et al.* (2019) explore the sedimentary and vegetative variability during the Last Glacial–Interglacial Transition, a study comparing two sites in Orkney.

Three papers in this collection explore geothermal research and decarbonisation in the Midland Valley of Scotland, a region with a long history in coal and petroleum exploration. Heinemann *et al.* (2019) investigate the potential to use low-carbon geothermal energy and subsurface energy storage to decarbonise the Scottish economy and society. Watson *et al.* (2019) assesses the influence of historical mining on geothermal observations across Greater Glasgow and explore the implications on heat flow into surrounding, flooded mine

workings. Todd *et al.* (2019) describe a method to assess the impacts of rising water on saturated pillar-and-stall workings using a coupled hydraulic and geomechanical model.

We therefore hope that this virtual collection of the *Scottish Journal of Geology* will help to identify and acknowledge the essential contribution made by this cohort of scientists. Our editorial team and our invited reviewers have taken on roles of both referees (to maintain the usual high standards) and mentors to facilitate a positive publishing experience for these talented authors.

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Author contributions

HAS: writing – original draft (equal), writing – review & editing (equal); MK: writing – original draft (equal), writing – review & editing (equal).

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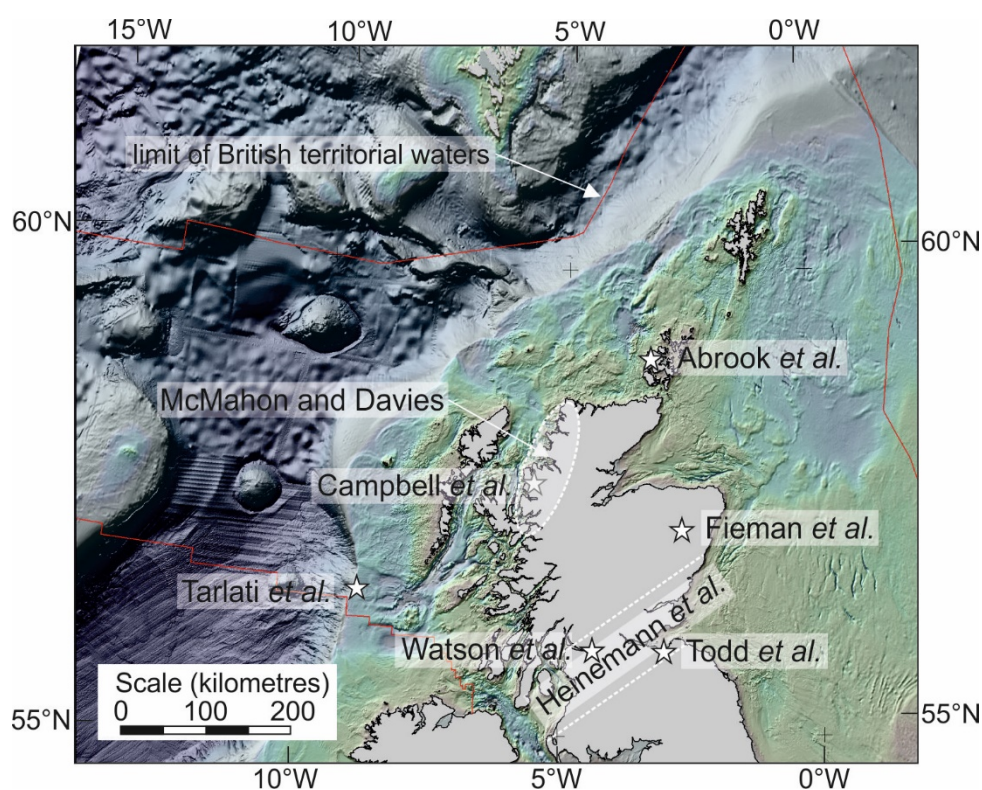


Fig. 1. Overview of study areas included in the Early Career Researcher thematic volume published by the *Scottish Journal of Geology*. General bathymetry from EMODnet Digital Terrain Model for European Seas. Digital bathymetry courtesy of EMODnet Bathymetry Consortium (2018) <http://doi.org/10.12770/18ff0d48-b203-4a65-94a9-5fd8b0ec35f6>